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PEOPLE ASPECTS OF TECHNOLOGICAL CHANGE: IMMIGRATION ISSUES, LABOR MOBILITY, THE BRAIN DRAIN, AND R&D – A U.S. PERSPECTIVE

James D. Van Erden^{*}

I would like to walk you through a little of what is going on in the United States that is driving innovation and creating change in the workplace. I will then come back to discuss an interesting analog of a supply chain management model. As we look at how companies get knowledge workers to the right place at the right time with efficient systems, the idea of a Knowledge Supply Chain comes into play. We have been doing some work, both in my prior job at the National Alliance of Businesses, and in my current position at Goodwill Industries, thinking about how to do this in the most effective way. The Knowledge Supply Chain model changes the relationships and the dynamics between public/private partnerships, not unlike what you heard Mr. Mathaisel from Ford talk about when he about talked about supply networks.

First, I want to say a few words about Goodwill Industries. Goodwill is the fifth-largest non-profit corporation in the world. We have 182 local Goodwill member organizations in the United States and Canada. We served over 328,000 people last year and our revenues were 1.5 billion dollars.¹ It is a very healthy non-profit that is growing very rapidly because of the various issues about which we are going to talk – the tightness of labor markets and the issues of reaching deep into labor pools that we did not traditionally reach into as little as four or five years ago in the United States.

Whether we talk to our friends in the Federal Government in Canada or in large corporations, we hear about the issue of change and the rate of change over and over again. Things are changing quickly. We really have to adapt to new ways of doing things, whether it is E-commerce, training through distance learning, or training with modules. In addressing that, we are really looking at how we provide timely and efficient knowledge delivery strategies. I will come back to talk about knowledge supply chains and how to adapt to new ways of delivering education and training.

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¹ See Goodwill Industries, Inc., *1998 Data* (visited July 12, 1999) <<http://www.goodwill.org/about398data.htm>>.

Last Sunday, I had the opportunity to address the National Continuing Education Association in Washington, D.C.. When you look into higher education today, the issue of change and the issue of how you adapt to new markets, though not necessarily the Internet markets, is driving the thinking right now inside of post-baccalaureate systems, continuing education, and community colleges. The delivery of knowledge and the way knowledge gets to individuals, as well as back into the companies, is going to change just as radically as the way Ford delivers cars. We really are on the forefront of some major differences.

What we have right now is a very tight economic environment. We are in a time of tremendous innovations – tight global markets are changing the way companies think about their skills and knowledge and about how and where they get people. Retention and replacement are the big issues. Five, six, or seven years ago, we had to worry about mainly economic anxiety and downsizing. We were concerned about how to get jobs for people who were displaced. It was difficult to think about changing welfare or some other social program and putting people back into jobs when the jobs were not there. You did not train people because there were no jobs on the other end.

Today, it is a very different environment. In talking to human resources people throughout the country, I have heard about two major problems: retention and replacement. The question they ask is, “Where do I find the workers, and how do I keep them?” This is occurring in an environment in which technology is changing the way we work, the way we get people, and the way we organize our businesses. Business right now is very concerned about getting job-ready, entry-level workers, workers with high skills, but also workers who can continue to learn. Lifelong learning is a growing issue that will drive how people are educated and trained.

At the same time, we have changed the social contract. It is not like it was thirty years ago, when you could go to Ford and they would guarantee that if you were a good person and you worked hard on the line, you would work for thirty years and get your gold watch when you retired. It is very different today, and we will see that a little bit later when we talk about some examples at Motorola and some other companies. Basically, individuals now have an increased responsibility for managing their careers.

This is common knowledge for all of you who are here in school now. It is the older folks, the folks who are at the forefront of the transition curve that may be having trouble thinking about this. But the idea that you are now the CEO of the “company of me” is a very different concept than what I learned when I went through school. I interviewed with IBM and even with the Air Force before I finally went to work for the Department of Labor, which was actually one of the most stable places you could work. All of the

aforementioned companies have downsized considerably in the last few years. But the idea that you sought stable employment and your employer took care of you is very different in today's labor market.

What this means is, as we dig deeper into the labor pools into which we traditionally have not reached, such as the welfare population or individuals with disabilities, these populations face new challenges from social policy, as well as in changing labor markets. We need to know a lot about what is going on in current and future labor markets. This is a classic issue. It is certainly an issue for Ford when they are looking at how they sell cars, to whom do they sell them, and how they segment their market.

What is happening to an individual trying to plan a career? What kinds of skills should they be training for now? For which companies should they go to work? Employers today tell you that they would like to have you stay and to be the best worker you can be while you are there. But they also want you to get ready for your next job, for they cannot guarantee lifelong employment.

This concept is one that is quite different for the Generation X-ers and other skilled workers. Now they are thinking, what can this company do for me? How can I learn more to enhance my skills? Where will it take me into the next environment? Where do I go from here? It is not about loyalty to the company anymore; it may be loyalty to a project or to some other thing that most of us were probably not thinking about when we entered the labor markets.

This is happening now because labor markets are very tight. What happens when the economy goes south? We can argue about what happens when it goes south, where it goes south, what part of the economy goes south. I would argue that we really are at a point where we have a very fundamental shift in these labor markets. Even if we had a recession or a downturn in the United States, which I do not think anybody is anticipating right now, these markets will still stay relatively strong. They will stay very strong for high-tech knowledge workers. Notice that I did not say high-wage, but high-tech, high-knowledge workers.

Look, for example, at a company like the United Parcel Service (UPS), which is one of my favorite companies. They sort packages from 10:00 at night until 2:00 in the morning. They have a few pilots, and everybody else drives a truck. But, have you looked at your UPS truck driver lately? He/she comes in with three computers hanging off his belt and UPS knows exactly where all the packages are. If you called UPS and asked where your package was, they could tell you it is at 10,000 feet over southern Kansas and will be delivered in three hours and ten minutes. When you talk to the folks at UPS, they will tell you they are not a packaging company anymore – they are an

information distribution company. They distribute knowledge. They will tell you where your packages are, when you are going to receive them, and how to ship them. They basically provide a lubricant to this new E-Commerce economy about which we are talking. They also have 400,000 employees.² They interview 300,000 a people year, and they hire over 100,000 people a year.³ It is a very dynamic organization, and it is doing quite well. It is not listed on the New York Stock Exchange either.

When you look at labor demand and the labor supply in the United States, you will see that, for the last thirty years, the labor demand in this country has exceeded the labor supply. We did a little analysis a couple of months ago in terms of the current unemployment rate. While the unemployment rate is 4.2 percent in the United States today, which is an historical, roughly thirty-year low,⁴ it looked like it could be somewhere around six or six and one-half percent and still, if you can move everybody seamlessly through the system, you would have not met the excess of jobs that are in demand today.

Northern Virginia, where I live, just outside of Washington, is now becoming one of the real hot beds of information technology. In fact, fifty-two percent of the world's Internet service providers are in Fairfax County, Virginia.⁵ There are 30,000 vacant information technology jobs today.⁶ That corresponds to some numbers that the Information Technology Association of America (ITAA) has put out estimating that there are some 300,000 jobs available nationwide.⁷ If we start looking at those kinds of deficiencies, we realize that, if we could train people and get the right kind of folks into the workforce, there are huge numbers of jobs waiting for them, and not just in information technology.

One of things that we are finding as this model changes – and I think Ford and others will tell you that this is true – is the idea of who you work with has changed dramatically. This is primarily because of the way we can now share information, through the Internet, e-mail, and in other ways. It is much easier to collaborate with workers who are not co-located with you. I was doing some work with AT&T a couple of years ago, and we were talking

² See United Parcel Service, *UPS at a Glance* (visited July 12, 1999) <<http://www.ups.com/about/glance.html>>.

³ See *id.*

⁴ See Shlomo Z. Reifman, *The Forbes/Bridge Report Economic Forecast*, FORBES, July 26, 1999, at 46A.

⁵ See Omar L. Gallaga, *Fairfax County, Virginia and Austin, Texas Share High-Tech Economic Base*, AUSTIN AMERICAN-STATESMAN, May 4, 1999, available in 1999 WL 17335723.

⁶ See Sabrina Jones, *In High-Tech Jobs, Pay's Going Higher*, NEWS-OBSERVER (Raleigh, NC), Apr. 27, 1999, at D1.

⁷ See *id.*

about teams. At the same time, the U.S. Congress was debating whether to pass a law that said you can have teams without labor unions. In this example, if you talk to some of the companies that are working in the global marketplace, they are talking about things like the Harley Davidson teams, a work group on the floor that gets together. Maybe they do not have a union person there, but they have a supervisor. They do their work and they move on.

The teams that leading global companies are employing today are truly global teams. If you talk about fixing a long-distance networking problem at AT&T, you would probably call in somebody from IBM, Microsoft, or maybe someone from UUNet. You might call in a whole variety of people to solve that problem because that is the environment in which you are working today. It is a very different team model than we are used to thinking about. The United States is clearly the leader in terms of these industrial and technological alliances compared to rest of the world.

Another interesting thing is government programs. We think that government programs ought to help us through this process, with such things as welfare programs, retraining programs, and dislocated worker programs. The Urban Institute did a recent survey showing that a vast majority of U.S. employers, eighty or ninety percent, said that they did not know there was a government program available that would help them. A few said that they knew about one, but they did not use it. A very small percentage of employers actually use government programs, such as the Work Opportunity Tax Credit and training programs out of the Job Training and Partnership Act (JTPA). At the same time, we are finding that the number of companies reporting skills shortages is growing rapidly. In 1993, it was twenty-seven percent; in 1995, forty-four percent, and in 1998, sixty-nine percent of the companies from a Coopers and Lybrand study said they had various skill shortages.⁸

This really gives us another indicator of what is going on inside the internal labor market within companies and also what is happening in the external labor markets and about how the need for skilled labor is growing. It is not just a high-skill issue. If you go to Cleveland, Washington, or any other city, and walk down the main street and count how many stores have "help

⁸ See generally *Emerging Trends in the Information Technology Job Market: How Should the Public and Private Sectors Respond?*, Testimony before the Subcommittee on Oversight and Investigations, Committee on Education and the Workforce, U.S. House Rep., Apr. 23, 1998 (statement of Dr. Robert I. Lerman, Director, Human Resources Policy Center, Urban Institute) (visited July 12, 1999) <<http://www.urban.org/TESTIMON/lerman4-23-98.html>> (predicting heavy demands for high-tech workers in the future and discussing the shortage of people to fill those jobs).

wanted” signs in the window, you will see that it might be easier to count the stores that do not have “help wanted” signs in the window. As we look at this, we find that the number of companies that are reporting both skilled and unskilled shortages is growing.⁹ Every indicator we have points to tight labor markets, increasing technology, increasing skill demands, and increasing responsibilities on both companies and employers to raise those skills to higher levels. We are finding that there are still lots of shortages in both areas of skilled and unskilled workers.

At the same time, we think there are a lot of stable companies out there. Take the Fortune 500, which is really the basis of the U.S. economy. When we look at the numbers more closely, we find one-third of the Fortune 500 companies in 1970 were not on the list in 1983. One-third of the Fortune 500 companies on the list in 1983 were not on the list in 1990. And, sixty percent of the Fortune 500 companies in 1990 were not on the list in 1995.

In the world of skill sets we see similar change. The half-life of a software engineer is two and a half years now.¹⁰ If you ask Hewlett Packard, they will tell you it is about a year and a half. For those going through college, studying information technology, by the time they graduate with a four-year degree, probably a year and a half of the information they learned while they were in school is obsolete. That does not say that they should not get a degree or that they should not go to college. The issue is that, as we talk about change in technology and skills, this rate of change is increasing, which means we are constantly in a lifelong learning environment. We have to continually learn just to stay constant with what is going on.

By the year 2000, fifty percent of the world’s scientific engineering knowledge will have been generated between 1993 and the year 2000. And, of course, the Internet allows us to share this information much more quickly and efficiently than we did before. For example, it used to take five to six years to produce a car from an original design. Now, it takes two years or less.

Let us look at the Eaton Corporation. Their goal for annual sales for new products is thirty-five percent in 2001, up from ten percent today. 3M has thirty percent of their sales from products that are less than four years old.¹¹ Rubbermaid has 400 new products a year and one new market every eighteen

⁹ See *More Business Economists in Survey See Difficulty in Finding Skilled Workers*, MILWAUKEE SENTINEL, July 2, 1999, at 2.

¹⁰ See Tom McEwan, *Teaching for Life Beyond the Realm of Microserfdom*, SUN. HERALD (London), Feb. 28, 1999, at 17.

¹¹ See 3M, Inc., *About 3M: About Our Company and Products* (visited July 13, 1999) <http://www.mmm.com/intl/IE/english/about/ab_hi_001.html>.

months.¹² Hewlett Packard gets seventy-seven percent of their revenue from products that are less than two years old. This change creates a very dynamic labor market, one requiring knowledge workers.

Geopolitical boundaries are really ceasing to exist with respect to knowledge. We heard about the problem in Canada, people are moving back and forth. It is very easy to do because, if you are a knowledge worker in Canada, it is pretty likely that there is a job in the United States that looks just like your job. While they are not exactly the same, there is commonality throughout. So, it is really easy to move around.

About a year and a half ago, I spoke to Bob Galvin, who was the CEO of Motorola. Motorola is a global leader in education and working in communities. When you ask Bob Galvin about what he is doing in local communities, he is just as conversant about the high schools in Beijing as he is about the high schools in Schaumburg, Illinois, because those schools that are providing knowledge workers for Motorola's companies are also those schools educating consumers who will buy Motorola's products. The idea of somebody sitting in Schaumburg being more concerned about High School Number 123 in Beijing than about Schaumburg High School really gives you a sense that the mental model is changing among companies. They are thinking about where they put their work force and what they do with it. So, it has a big impact on where you place your organization and how you get workers.

There is a huge debate in Washington about the H-1B visa.¹³ Because of a push by the information technology folks, the quota was raised from 65,000 to 110,000.¹⁴ The high-tech companies would like to have more H-1 workers, but if they cannot get them, they can just create a "virtual visa" by moving the work to India, Israel, or wherever the skilled workers are. You have to listen to how you solve that problem. The companies do not care. Bill Wigenhorn, who runs Motorola University, has three major learning centers right now: one in Schaumburg, one in Israel, and they are setting up a new one in Italy. These are all major learning centers where they will bring their educated workers in to re-train them, help them achieve lifelong learning, and put them back into productive jobs. These centers are not just in the United States, they are all over the world.

¹² See Rubbermaid, Inc., *Quick Facts About Rubbermaid, Inc.* (visited July 13, 1999) <<http://www.rubbermaid.com/corp/more/rd2main.htm>>.

¹³ See Ramesh Mathur, *Entrepreneurs May Still Gain Entry into U.S.*, NEWS-INDIA TIMES, Jan. 23, 1998, at 2.

¹⁴ See American Competitiveness and Workforce Improvement Act of 1998, Pub L. No. 105-277, 112 Stat. 2861-641 (codified as amended at 8 U.S.C. § 1101).

There is a book that came out last year, *Unleashing the Killer App*.¹⁵ It is a wonderful book that discusses social problems and the workplace. It talks about how quickly technology is driving change in the workplace. As my friends from Canada know, and based on my twenty years in the Department of Labor, we know that government agencies or public systems, even universities, do not change at the same rate as companies do as a result of the changes in technology. So you are getting not only a gap in R&D, but you are getting a gap in the ability of the traditional providers, whether it is a K-12 system or a good engineering school, to keep up with what is going on inside the workplace.

A lot of the high-tech companies today will tell you they are most dissatisfied with the engineering schools in terms of those graduating with baccalaureate degrees. But, if you go to the engineering professors and deans, they will say they are the best in the world. They are probably right. But, when you align what is coming out of the engineering schools with what is going on inside Boeing or Texas Instruments, the folks inside will tell you that the schools are not giving them what they need. The schools are giving them engineers who are used to sitting at a CAD/CAM¹⁶ machine designing all day long. But, the companies are going to put these graduates into a customer-service-oriented team that is going to have to design the next airplane or digital signal processor. The engineers will have to be able to design to cost; they will have to work with teams, they will have to be able to talk to customers; they will have to be able to listen. Traditionally, you went into engineering because you did not want to do a lot of those things. You wanted to sit and design, and that is what you did.

Harry Stonecipher, the President and Chief Operating Officer of Boeing, was addressing some engineering deans one day. A very well-known dean of an engineering school brought up the same question. The dean, noting that they had a very full curriculum, asked what do you want us to change? Stonecipher replied, "You don't get it. I am not going to tell you what to teach. I am going to tell you what I need and you have to figure it out."

That is not unlike what you see back in the supply chain when you talk about what people have done. They work together to define outcomes and where they need to go. They begin to work together on the solution to a problem. But engineering schools and schools in other occupations do not understand. There are a lot of areas where people do not change as fast as it is required to change in the work place. They think they are doing everything right.

¹⁵ LARRY DOWNES ET AL., *UNLEASHING THE KILLER APP: DIGITAL STRATEGIES FOR MARKET DOMINANCE* (1998).

¹⁶ Computer-aided design and computer-aided manufacture.

Goodwill Industries is a wonderful organization. We have some wonderful local Goodwills that are doing some very innovative things. But, we also have some other non-profits out there thinking that, if they lose money, they are being a good non-profit. Well, if you do that too long, you will not survive. You have to figure out how to change to adapt to the customer, whether the customer is an individual you are training or the company for which you are trying to provide personnel. Very often it is especially hard for public systems to make rapid change. Some are doing a better job than others.

Henry asked me to talk about entry-level workers. In a Coopers and Lybrand study, thirty-one percent of the companies polled said that entry-level people were deficient in problem-solving skills. In other words, companies need people who can solve problems. They also need workers who understand what is required of them; working in teams, showing up on time, taking responsibility, and having the ability to learn.

When you were in school, how did you take a test? You cleared your desk and put all your books out of the way. You had an eraser and a pencil, and you had to remember everything, right? You regurgitated the facts, you gave it all back. Then the teacher said you passed or you failed. Now let us consider how you applied this knowledge to work. What happened the first day on the job, unless you went into an old line manufacturing plant or something like that? Your employer showed you the people with whom you would work and told you to use anything you had to try to solve a specific problem. This is very different from the way you were taught in school. We just really have to remind ourselves with the K-12 system and with other kinds of training providers that we must get ready for what is going on in the workplace. That is why it is so important to understand how that workplace is changing, how those skills sets are changing, and how quickly we are looking at new ways of getting knowledge and using it. These concepts are critical to consider as we try to bring workers from the welfare population, which is a non-traditional labor pool into the workforce. We are beginning to reach very deeply to get entry-level workers.

We have to put all of these ideas in a different context when we begin to think about the new entrants to tomorrow's workforce. For example, my ten-year-old daughter, when she was eight years old, came to me one day and said, "Dad, we have to get a new computer." I said, "Jennifer, why do we need a new computer?" She put her hands on her hips, and said, "So I can spend more time on the Web." A couple of months ago, she came to me and said, "Dad, do you want to see my home page?" I said, "Your home page?" She has a little friend who lives down the street who is also ten years old. They had created their own home pages, which has pictures of our dog, pictures of the kids swimming, and such. She is ten years old, and she does this

in between doing her homework, doing her research on the Web, and also keeping her America Online (AOL) chat group going. Have you seen the AOL chat groups? My older daughter, who is thirteen, has about thirty-five buddies on her list. The first thing she does when she gets home at night is log on to the computer and see what is going on in the chat room. She does not use the phone.

Back to the issue of direct personal contact to achieve social communication – I would argue that for us, for me, that is an issue because that is how I learned to communicate when I grew up. How are these ten and fifteen-year old kids communicating today? Cell phones and e-mail are their social environment. Are they going to be comfortable ordering a car over the Internet? You bet. In fact, they would wonder why you would go anywhere else. Are they going to be very comfortable doing their research over the Internet? Certainly. Why would they go to a library to try to check out a book that may not be there; or find a book five years old at best, or maybe find a periodical after having gone through forty-five stacks looking for some articles to photocopy, take home, and type into your computer? That whole world is changing. It is a transitional issue.

My wife and I argue about this all the time. I used to work on the military base closing commission, where we dealt with shutting down military bases all over the country. I am reaching a little bit here, and you will all say I am crazy, but I think someplace down the road, we will have a closing commission for four-year colleges, because you are going to have to figure out what to do with all the physical plant sitting out there that nobody is going to want to attend. That does not mean that you are going to close Harvard or Case Western Reserve University or Yale, but when you really think about how the world is changing, how we educate folks through corporate universities, distance learning, and Internet training systems, why would you come to a place to sit and listen to somebody like me talk for a couple of hours so I can take notes and go home?

This is going to change even more with future changes in technology. There was an interesting article in *Business Week* a little while ago that talked about fiber optic cables, the thin strand of cable.¹⁷ Right now scientists are breaking light into light spectrums, so you can increase the throughput dramatically. The theoretical limit on a single strand of fiber optic cable is about 200 terabits a second. Do you know to what 200 terabits a second is equivalent? That would be the entire contents of the Library of Congress in one second. When I get that to my desktop, it will be great.

¹⁷ See Otis Port, *Through a Glass Quickly: Advances in Optical Fiber are Revolutionizing Telecom*, BUS. WK., Dec. 7, 1998, at 96.

As I stated earlier, when we look at getting entry-level workers from our tight labor markets, in the United States, we have to reach into very non-traditional labor pools. We changed the welfare system in this country about four years ago. We blew up a bureaucracy and gave it lots of flexibility. We told the folks on welfare that they have to get into the labor market. We did it at probably the best time we could have done it. As a result, welfare rolls today are down over forty-four percent in the United States.¹⁸ In Wyoming, they are down ninety-five percent. In Wisconsin, which is a large state, they are down over seventy percent.¹⁹ This indicates to me, at least, that there are ways to get people into meaningful jobs whom we did not traditionally think could be in the labor force.

We are finding that companies such as Xerox, UPS, United Airlines, American Airlines, and others – report that the retention rates for people who are hired through “welfare-to-work” programs are significantly higher than they are for anyone hired off the street in non-welfare programs. In fact, some companies like Xerox and Gateway are reporting retention rates of close to one hundred percent a year later.

Under welfare reform, we are seeing employers who are becoming increasingly involved. The numbers that are coming back so far have been extremely satisfying, and one of the reasons for that is that companies have created different alliances with education and training providers than they had before. They did not go to the welfare system and say, “Send me five people, and I will see if I can hire them.” They went back to the intermediary model, the folks who train for the workplace – there are hundreds of these, thousands in the United States, mom and pop shops – as well as public systems, and said, “Let’s work together to figure out how we can take these folks and get them the right kinds of skills we need in the market today. I will work with you to help you get folks to that level.” American Airlines did a great job with this and was able to shift some of their post-employment training back into the pre-employment public systems for training. That has helped everybody.

As for education, the requirements are going to continue to increase over the next few years. We looked at the share of jobs in 1996 who had high skills, medium skills, and low skills. If we look at the projection from 1996 to 2000, we find the number of high-skill jobs increasing, while medium and low-skill jobs are decreasing. We are continuing to move into a higher knowledge-based economy. This is impacting labor markets.

As I mentioned earlier, we now see a number of different models being developed to solve these problems. Motorola University is one of over 1700

¹⁸ See Aimee Howd, *Welfare Reform*, INSIGHT MAG., July 5, 1999, at 44.

¹⁹ See *id.*

corporate universities. Ford also has a corporate university. The corporations are saying that if we can no longer rely on public systems to give us the workers we need, we will start to do more training in-house in a corporate university environment. Dell University, which is run by Dell Computer, is going to have sixty or seventy percent of their classes on-line. They hope to be totally virtual in a short time.

Open University in the United Kingdom is the largest university in the world. They have a presence in twenty-five countries, and they are moving into the United States. This is a total virtual university. When Open University was studied by the British government a year ago, the engineering school at Open University ranked ahead of Oxford and Cambridge.²⁰ I just saw Sir John Daniel, the head of Open University, in an audience to which I was speaking last week. He came up to me afterwards, and I asked him if that was true. He said it was.

There are huge efforts going on inside post-baccalaureate institutions moving from traditional degrees into certificates, because certificates are a way of identifying what skill sets you have. Companies are looking to see if you have the right kind of skill sets. They want to know if are you certified. The idea of having a degree is important, too, to show that you can learn. It is less important in terms of whether you get the job. We are going to see more changes in training, and we are seeing, finally, a movement away from instructor-led training in companies. By 2001, more than half the training will be done someplace other than in a classroom.

Workers inside companies think about themselves in a different way. The workers who identify with the corporation think about things very differently than software engineers. The corporate person envisions himself as sort of a supertanker skipper, while the software guys think they are fighter pilots. There is a wonderful Web site I just found called RainmakerThinking.com.²¹ It was founded by the individual who wrote the book *Generation X*,²² and it is a whole Web site dedicated to how Generation X workers are going to think about their jobs.

We are looking at how to create a different model to get knowledge workers into the workplace, keep them there, and keep them in lifelong learning. The idea that you would just take somebody from a four-year

²⁰ See A.R. Dean, *Minister's Duty to Ensure Rankings of Institutions Are Fair, Reliable*, N. STRAITS TIMES, July 17, 1999, at 2.

²¹ RainmakerThinking, Inc. is a research, training, and consulting firm focused on the working lives of those born after 1963. For more information, see <<http://www.rainmakerthinking.com>> (visited Aug. 12, 1999).

²² DOUGLAS COUPLAND, *GENERATION X* (1992).

school, plunk them into the workplace, give them some training, and hope they survive is not going to work in this kind of economy.

What we are talking about here is creating the analog to the supply chain on the knowledge side, a Knowledge Supply Chain. I did not come up with this – it came out of the Next Generation Manufacturing Project.²³ It is also a result of some work done at MIT. The idea here is that we create a different relationship between an organization, say a company, and the folks who run that supply chain. We are talking about people in post-secondary training, engineering schools, community colleges, K-12 systems, public systems, and dislocated worker programs. You take the principles of a supply chain and change the dynamics. The partners then work together on a common vision, common outputs, then work together to share this vision of how to generate educated workers with skill sets that are in demand in the workplace. If this happens, schools and a lot of public training providers that do not want to change will be left out. Successful companies and suppliers will create partnerships that move forward, creating very different ways to get knowledge workers into jobs and keep them in jobs.

I will leave you with that thought. I think this is a very dynamic change. I keep saying that, but you cannot say it enough. As we move forward, it is going to be, I think, an exciting time. We are going to see tight labor markets, increasing skill set demands, and new ways of getting knowledge workers into the workplace.

²³ See *Conquering a World of Change (Global Economy Spurs Change in Manufacturing Industry)*, INDUSTRY WK., Sept. 21, 1998, available in 1998 WL 20137718.

